

IN THE CLAIMS

1. (Previously presented) A method of forming a thin film using atomic layer deposition (ALD), comprising:
 - providing a reactor having a single reaction space;
 - concurrently loading a batch of substrates into the single reaction space of the reactor;
 - introducing a gas containing reactants into the single reaction space, and chemically adsorbing a portion of the reactants on top surfaces of the substrates within the single reaction space;
 - diluting non-chemically adsorbed reactants in the single reaction space; and
 - removing non-chemically adsorbed reactants from the single reaction space,wherein said introducing the gas containing reactants is performed at a first pressure and said diluting is performed to a second pressure, and wherein the second pressure is greater than the first pressure.
2. (Cancelled)
3. (Cancelled)
4. (Previously presented) The method of claim 1, wherein the first pressure is between approximately 0.1 Torr and approximately 0.5 Torr.
5. (Previously presented) The method of claim 1, wherein said second pressure is greater than approximately 1.5 times the first pressure.
6. (Previously presented) The method of claim 1, wherein said removing comprises pumping the reactor, thereby lowering the pressure of the reactor to a third pressure, and
 - wherein the third pressure is lower than the first pressure.
7. (Previously presented) The method of claim 6, wherein the third pressure is lower than approximately 0.5 times the first pressure.

8. (Original) The method of claim 1, wherein said loading comprises transferring the batch of substrates using an automatic wafer transport mechanism.

9. (Previously presented) A method of forming a thin film using atomic layer deposition (ALD), comprising:

providing a semiconductor substrate into a reactor;
introducing a gas containing reactants into the reactor at a first pressure, and chemically adsorbing a portion of the reactants on the substrate surface;
diluting non-chemically adsorbed reactants in the reactor such that the pressure of the reactor is increased to a second pressure; and
removing the diluted non-chemically adsorbed reactants from the reactor.

10. (Previously presented) The method of claim 9, wherein the first pressure is between approximately 0.1 Torr and approximately 0.5 Torr.

11. (Previously presented) The method of claim 9, wherein said second pressure is greater than approximately 1.5 times the first pressure.

12. (Previously presented) The method of claim 9, wherein said removing is performed by pumping the reactor, thereby lowering the pressure of the reactor to a third pressure,

wherein the third pressure is lower than the first pressure.

13. (Previously presented) The method of claim 12, wherein the third pressure is lower than approximately 0.5 times the first pressure.

14. (Original) The method of claim 9, wherein the reactor includes a pressure control valve connected to an exhaustion line for removing the diluted non-chemically adsorbed reactants and, wherein said diluting comprises substantially closing the control valve and supplying an inert gas into the reactor while substantially stopping the introduction of the gas containing reactants into the reactor.

15. (Original) The method of claim 9, wherein the reactor includes a pressure control valve connected to an exhaustion line and, wherein said diluting comprises supplying

an inert gas with an amount substantially more than the amount of the gaseous reactants introduced into the reactor while stopping the introduction of the gaseous reactants into the reactor.

16. (Previously presented) A method of forming a thin film using ALD, comprising:
providing a plurality of wafers into a single reactor;
introducing gaseous reactants into the single reactor at a first pressure, and chemically adsorbing a portion of the reactants on top surfaces of the plurality of substrates;
diluting non-chemically adsorbed reactants in the single reactor to a second pressure;
and
removing the diluted non-chemically adsorbed reactants from the single reactor,
wherein said second pressure is greater than the first pressure.

17. (Original) The method of claim 16, wherein the reactor includes a pressure control valve connected to an exhaustion line and, wherein said diluting comprises substantially closing the control valve and supplying an inert gas into the reactor while stopping the introduction of the gaseous reactants into the reactor.

18. (Original) The method of claim 16, wherein the reactor includes a pressure control valve connected to an exhaustion line and, wherein said diluting comprises supplying an inert gas with an amount substantially more than the amount of the gaseous reactants into the reactor while stopping the introduction of the gaseous reactants into the reactor.

19. (Previously presented) The method of claim 16, wherein the first pressure is between approximately 0.1 Torr and approximately 0.5 Torr.

20. (Previously presented) The method of claim 16, wherein said second pressure is greater than approximately 1.5 times the first pressure.

21. (Previously presented) The method of claim 16, wherein said removing is performed by pumping the chamber, thereby lowering the pressure of the reactor to a third pressure, wherein the third pressure is lower than the first pressure.

22. (Previously presented) The method of claim 21, wherein the third pressure is lower than approximately 0.5 times the first pressure.

23. (Cancelled)

24. (Original) The method of claim 16, wherein the reactor is a furnace-type reactor and, wherein substantially all the top surfaces of the substrates face the same direction for automated wafer transfer.

25. (Original) The method of claim 16, wherein the number of the plurality of substrates is more than one hundred.

26. (Original) The method of claim 16, wherein the reactor has a single reaction space for atomic layer deposition such that all of the substrates are placed within the single reaction space.

27. (Previously presented) An atomic layer deposition (ALD) method of forming a thin film layer, comprising:

- a) inserting one or more semiconductor substrates into a chamber;
- b) introducing a first gaseous reactant into a reactor at a first pressure, and chemically adsorbing a portion of the reactants on the surfaces of the one or more substrates;
- c) diluting non-chemically adsorbed first reactants in the reactor by injecting an inert gas into the chamber to increase the pressure of the reactor than the first pressure;
- d) removing the non-chemically adsorbed first reactants from the chamber;
- e) introducing a second gaseous reactant into the reactor at a second pressure to form a single atomic layer by chemical exchange;
- f) diluting non-chemically adsorbed reactants in the reactor such that the pressure of the reactor is increased; and
- g) removing the non-chemically adsorbed reactants from the chamber.

28. (Previously presented) The method of claim 27, wherein the first pressure is substantially the same as the second pressure.

29. (Currently amended) The method of claim 27, wherein the first ~~predetermined~~ pressure is different from the second pressure.

30. (Previously presented) The method of claim 27, wherein, during said first and second diluting, the reactor pressure is increased to not less than approximately 1.5 times the first and second pressure, respectively.

31. (Previously presented) The method of claim 27, wherein said removing is performed by pumping the chamber to a third pressure substantially lower than either first or second pressure.

32. (Original) The method of claim 27, wherein the single atomic layer is an oxide layer of Al_2O_3 , TiO_2 , ZrO_2 , HfO_2 , Ta_2O_5 , Nb_2O_5 , CeO_2 , Y_2O_3 , SiO_2 , In_2O_3 , RuO_2 , or IrO_2 .

33. (Original) The method of claim 27, wherein the single atomic layer is a composite oxide layer of SrTiO_3 , PbTiO_3 , SrRuO_3 , CaRuO_3 , $(\text{Ba},\text{Sr})\text{TiO}_3$, $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$, $(\text{Pb},\text{La})(\text{Zr},\text{Ti})\text{O}_3$, $(\text{Sr},\text{Ca})\text{RuO}_3$, $(\text{Ba},\text{Sr})\text{RuO}_3$, Sn doped In_2O_3 (ITO), Fe doped In_2O_3 , or Zr doped In_2O_3 .

34. (Original) The method of claim 27, wherein the single atomic layer is a nitride layer of SiN , NbN , ZrN , TiN , TaN , Y_3N_5 , AlN , GaN , WN , or BN

35. (Original) The method of claim 27, wherein the single atomic layer is a complex nitride layer of WBN , WSiN , TiSiN , TaSiN , or AlTiN .

36. (Original) The method of claim 27, wherein the single atomic layer is a metal layer of Si, Al, Cu, Ti, Ta, Mo, Pt, Ru, Rh, Ir, W, or Ag.

37. (Original) The method of claim 27, wherein the single atomic layer is a silicide layer of Al, W, Ti, or Co.

38. (Original) The method of claim 27, wherein the single atomic layer is a metal silicate material ($M_{1-x}Si_xO_2$), the metal "M" being selected from the group consisting of hafnium (Hf), zirconium (Zr), tantalum (Ta), titanium (Ti), Cesium (Cs) and aluminum (Al).

39. (Original) The method of claim 27, further comprising the step of repeating at least one of steps (b) – (g).

40. (Currently amended) A method of forming a thin film, comprising:

- (a) providing a reactor having a single reaction space;
- (b) concurrently loading the plurality of wafers having a processing surface into the reaction space, wherein the processing surfaces of the wafers face in substantially the same direction;
- (c) introducing a first reactant into the reaction space, wherein a portion of the first reactant is chemically adsorbed on the processing surface of each of the plurality of wafers;
- (d) diluting a non-chemically adsorbed portion of the first reactant in the single reaction space,
wherein said introducing the first reactant is performed at a first pressure and said diluting the non-chemically adsorbed portion of the first reactant is performed to a second pressure, and wherein the second pressure is greater than the first pressure;
- (e) removing a the non-chemically adsorbed portion of the first reactant from the reaction space;
- (~~e~~) (f) introducing a second reactant into the reaction space, wherein a portion of the second reactant is chemically adsorbed on the processing surface of each of the plurality of wafers; ~~and~~
- (~~g~~) diluting a non-chemically adsorbed portion of the second reactant in the single reaction space; and
- (~~f~~) (h) removing a the non-chemically adsorbed portion of the second reactant from the reaction space.

41. (Currently amended) The method of claim 40, further comprising ~~the step of~~ repeating at least one of steps (~~e~~)—(~~f~~) (c)–(h).

42. (Previously presented) The method of claim 1, wherein the single reaction space is not partitioned.

43. (New) The method of claim 41, wherein said introducing the second reactant is performed at a third pressure and said diluting the non-chemically adsorbed portion of the second reactant is performed to a fourth pressure, and wherein the fourth pressure is greater than the third pressure.